Precautions such as the removal of metals from the field of treatment, the proper spacing of electrodes, the special attention to dosage in the case of patients suffering from diminished or abolished sensation of heat, are the principal ones to be carefully observed. Under such circumstances short wave diathermy will prove one of the most effective therapeutic aids in a large number of otolaryngological conditions.

Summary

1. Heat has for a long time been used empirically in otolaryngology for the alleviation of pain, but its influence on underlying inflammatory processes is now recognized.

2. The limitations and disadvantages of conventional diathermy, especially in otolaryngology, have largely been overcome by short wave diathermy.

3. The results of several workers on the relation of clinical effects to experimental temperature determinations, especially in the sinuses, are reviewed.

4. For otolaryngological purposes special electrodes are required but any apparatus of adequate wattage utilized in general medicine is suitable.

5. Clinically short wave diathermy is a valuable adjunct in the treatment of nasal sinusitis but insufficiently effective in itself to replace classic therapeutic procedures.

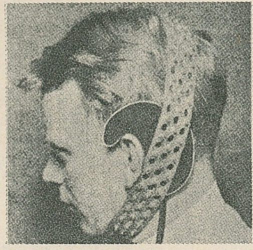

Fig. 9.—Position of electrode over left mastoid area.

6. Short wave diathermy is of value in promptly relieving the pain of acute tonsillitis, pharyngitis and laryngitis and in shortening their course when combined with indicated constitutional measures.

7. In otology short wave diathermy is an effective remedy for auricular infections, otalgia, acute myringitis and eustachian catarrh, but is of doubtful value in chronic pathological processes.

8. Every practitioner should be thoroughly familiar with dosage and method of application, and avoidance of undesirable reactions.

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CLINICAL EVALUATION OF SHORT WAVE DIATHERMY IN OTOLARYNGOLOGY*

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Heat has been used empirically in otolaryngology for a long time. While it was principally resorted to for the alleviation of pain, it was eventually recognized that it had a certain influence also on underlying inflammatory processes without its rationale being understood. The favorable experiences gained from the application of heat dictated the employment of thermogenic appliances as they became available from time to time, e.g., hot compresses, hot water bags, electric pads, and the like. But in the final analysis the difference in all these agencies was one of mechanical convenience rather than therapeutic superiority.

With the introduction of what is today designated as conventional diathermy, thermotherapy, or rather electrothermotherapy, was given an impetus and an advance far beyond that attained in the past. With this discovery we obtained a means of applying conversive, as compared with the conductive heat of the above mentioned applicators or the convective heat of radiant lamps. But the signal difference was not so much in the manner of production of heat as in the fact that by diathermy we were enabled to produce heat at levels considerably below that of the subcutis.

Conventional diathermy, however, has certain limitations and disadvantages, which soon might prove of purely historic interest. This is because with the type of higher frequencies known today as short wave diathermy most of the limitations and disadvantages incident to conventional diathermy have been overcome. But the main advantage obtained from short wave diathermy is the indisputable fact that it creates heat at much greater depths than was possible with conventionaal diathermy, and that bony structures which present an almost insurmountable obstacle to the penetration of the longer waves are easily passed through by the short waves.

Considering the osseous structure of the head and face it is evident that undoubtedly otolaryngology has greatly benefited from the employment of short wave diathermy.

Effects of Heat on Inflammation

Before entering into a discussion of this therapeutic agent, it might be well to point out some of the important effects of heat on inflammation. Heat within physiological limits applied locally manifests itself by the appearance of external reddening which to a great part is due to an induced hyperemia. Independently of this phenomenon, there is also a stimulation of the circulation of lymph, which under prolonged influence of heat leads to localized edema. The well known analgesic effects of heat are explainable through the two phenomena just mentioned, because they control infection through the very increase of the inflammatory process. Accordingly, the concept is justified that inflammation is a natural defensive reaction which should be augmented rather than suppressed and that the therapeutic value of heat is ascribable to hyperemia and hyperlymphia.

While all this is applicable in part at least to heat obtained from any source, the phenomena are created in a more pronounced form with heat produced by the high frequency current. The thermogenic effects of conventional diathermy have been utilized in many superficial and deep inflammatory processes, the only contraindication being active suppuration, and this perhaps more on theoretical grounds than on established evidence. This limitation does not obtain with short wave diathermy so that it becomes definitely indicated in all conditions accompanied by inflammation and infection.

Review of Experimental Work

The physiological effects of heat as observed both in the laboratory and at the bedside have been elaborated ever since the end of the past century, when August Bier (1) first contributed his ideas on the rôle of inflammation in the natural repair of diseased processes. While his concepts have in the main been confirmed by many workers, there remained the unanswered question whether or not general surgical experiences were applicable also to the domain of otolaryngology. It was for this reason that Cottle and I (2) early attempted to determine the comparative value of various heating agents on the eye and ear. Later Moncreiff, Coulter and Holmquest (3) studied the problem of heat penetration into the orbit. Cone's (4) temperature determinations were made of the nasal mucous membranes. Tebbutt (5) tried various agents from ice compresses, a hot water bottle to an electric pad and found that there is essentially no effect on the temperature of the sinuses when these agents are applied to the face. On the other hand, according to Tebbutt, the heat derived from the high frequency oscillating current and from the lamp used in his experiments apparently does cause a drop in the temperature within the sinuses and an increase in the production of sweat on the cutaneous surfaces. No rise in body temperature resulted from any of the agents. The relative heating value of six different sources was investigated by Andreen and Osborne (6) who found that the ability of these agents to produce heat in the antrum was in the following order: 1, electromagnetic field and diathermy; 2, thermospectral lamp; 3, Cutler water-cooled lamp; 4, compsolite; 5, short wave diathermy; and 6, the Elliott machine. In four instances a slight drop in temperature of between 0.2°F. and 0.4°F. was observed. These results are similar to Tebbutt's without however as great a drop in the temperature, which can be accounted for by the methods employed.

Bierman (7) investigated the temperature elevations produced in the intranasal region of the middle turbinate, the antrum, and the sphenoid, by means of short wave diathermy and found that it was possible to elevate the temperature of these areas. The degree of elevation is comparatively slight and, in fact, many of the readings were lower after the application of the short wave current than before. These findings coincide with the results of my own experiments in which, however, I avoided preliminary anesthetic agents described by several of the investigators. My experiments were performed only on acute cases.

In an effort to reconcile the favorable clinical effects and the experimental findings, Andreen and Osborne conjecture: "The benefit received from such methods is due in part to an increased circulation leading to an active hyperemia rather than to any change in temperature. If this is so, we wonder whether it would not be of greater benefit to give daily treatments of longer duration." Tebbutt is of the opinion that local heat is of definite value, despite the temperature drop in the sinuses, explaining, however, that in his opinion this phenomenon is apparently a part of the mechanism involved normally in the regulation of the temperature of the body.

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Bierman believes that the use of heat is of value in the treatment of nasal sinusitis. He and his co-workers have observed marked relief from pain following short wave diathermy. Many of his patients had been under treatment by specialists for years. It is emphasized that here, as elsewhere, adequate surgical drainage is important.

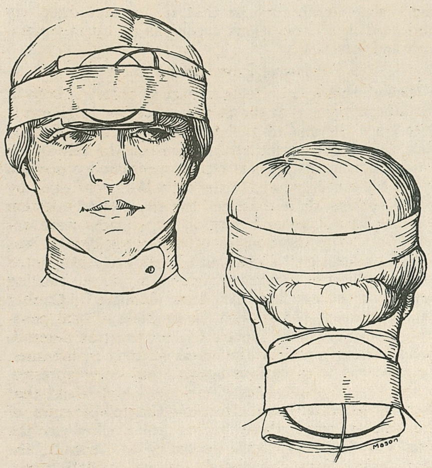

Fig. 1.—Position of condenser electrodes for treatment of frontal sinuses.

Without entering into a detailed description of my own experimental work, it must suffice to state that in the main my findings are in accord with those described. Clinically, short wave diathermy has proved conclusively that it is a valuable adjunct, but is insufficiently effective to replace classic measures to insure adequate drainage. In chronic cases of sinusitis certain operative procedures remain indicated now as before the advent of short wave diathermy.

Apparatus

For the medical management of otolaryngological conditions by short wave diathermy the required equipment may be grouped as an energy source and electrodes. It is beyond the scope of this paper to discuss the apparatus proper, since detailed descriptions are easily available. Suffice it to say that any apparatus of adequate wattage utilized in general medicine is suitable for our purposes. So far as wave length is concerned it has been found that for treatment of conditions about the head and neck frequencies ranging from thirty to six meters have proved satisfactory, though to insure adequate penetration in depth the six meter apparatus is preferable.

Just as there is need for special instruments for medical and surgical topical applications to meet the anatomical peculiarities of the ear, nose and throat, so special electrodes are needed for short wave diathermy to these parts. An exception to this is made only when it is proper to subject parts of the head to short wave current by condenser (air spaced) electrodes (8), in which case those used for general purposes are satisfactory.

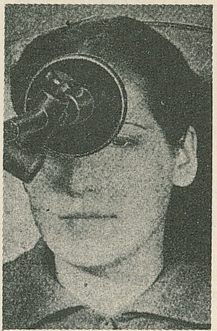

Fig. 2.—Position of air spaced electrodes for treatment of frontal sinuses.

For certain conditions short wave diathermy can be applied through an inductance coil. It should be stated, however, that all apparatus do not lend themselves to this method.

For the large majority of otolaryngological conditions rubber condenser electrodes are quite efficient (9). They are, however, not as easily or as conveniently applied as air spaced electrodes that are retained in a flexible holder attached to the apparatus itself or to a special floor stand. The facility of applying air spaced electrodes to the sinuses, ears, neck or other parts of the head and neck renders this the method of choice for short wave diathermy in otolaryngology.

The Nasal Sinuses

For treatment of the nasal sinuses the method of application depends on the sinus. Various technics have been suggested. For the frontal sinuses the electrode is placed over the frontal area and a larger dispersive electrode either on the nape or chest (Fig. 1). When air spaced electrodes are employed the same technic is followed (Fig. 2). The maxillary sinuses can be treated either separately (Fig. 3) or both simultaneously (Fig. 4).

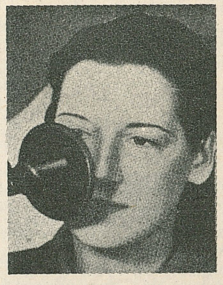

Fig. 3.—Position of air spaced electrodes for treatment of right maxillary sinus.

The posterior sinuses present a more difficult problem, but good clinical effects have been obtained by placing the electrodes more or less on a line through the antrum.

Short wave diathermy is most effective in the acute and subacute forms of nasal sinusitis (8) for which treatments should be given daily for ten to fifteen minutes (Fig. 5). Relief of pain is prompt. Drainage is improved and in many instances the course of the disease is shortened. It should be stressed that at no time should short wave diathermy be employed to the exclusion of other indicated procedures. Its rôle is merely that of a therapeutic adjunct.

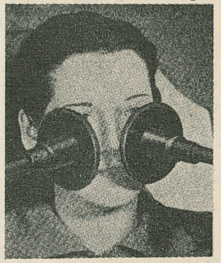

Fig. 4.—Position of air spaced electrodes for simultaneous treatment of both maxillary sinuses.

For chronic sinusitis short wave diathermy has been found to be of equal but not superior value to conventional diathermy (10). Relief of symptoms is frequently experienced, but it is doubtful whether cures are obtained even when short wave diathermy is added to the usual procedures. This is especially true with reference to the posterior sinuses. As postoperative therapy short wave diathermy has proved of value in promoting freer drainage and hastening resolution.

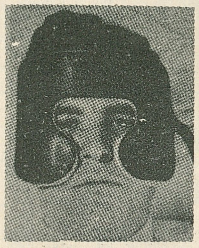

Fig. 5.—Special electrode for treatment of pansinusitis.

Tonsillitis, Pharyngitis and Laryngitis

In acute tonsillitis, especially recurrent exacerbations, short wave diathermy is of material value in promptly alleviating pain and discomfort. The use of anodynes is avoided if treatment is instituted early. Electrodes are placed over the tonsillar areas (Fig. 6) or several turns of an inductance coil are placed around the neck (Fig. 7).

The same technic is employed in acute pharyngitis and cervical adenitis. For the latter one electrode is placed over the involved gland and the other on the opposite side of the neck. For glandular swellings, cellulitis and other infectious processes of the neck, treatment with the inductance coil is convenient and effective.

For the simple forms of acute and subacute laryngitis and for chronic laryngitis daily application of the inductance coil for fifteen minutes at comfortable heat tolerance has given gratifying results (11). It is assumed of course, that due consideration will be given to all etiological factors and that required constitutional measures will be utilized.

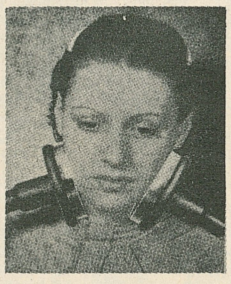

Fig. 6.—Position of electrodes for treatment of tonsillar areas.

Otological Conditions

Short wave diathermy has been recommended especially for pyogenic skin infections (12). It is an effective remedy for auricular infections and for furunculosis of the auditory canal. If applied sufficiently early, the condition often can be aborted. Daily treatments are essential with one electrode over the affected ear and the other at any convenient part on the opposite side.

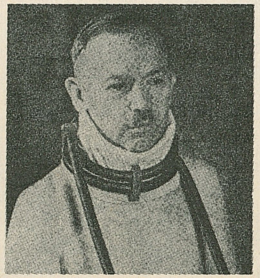

Fig. 7.—Position of inductance coil for neck treatment.

In otalgia, acute myringitis, and acute eustachian catarrh short wave diathermy acts as an effective analgesic. The electrodes are best placed over the auricles (Fig. 8) and treatments given daily for ten to fifteen minutes. Due attention must be paid to nasal, pharyngeal and nasopharyngeal conditions which usually are the underlying causes of these aural processes. European workers have reported on the use of short wave diathermy in acute mastoiditis. The hazardous complications of mastoiditis preclude a trial of short wave diathermy when surgical intervention is definitely indicated.

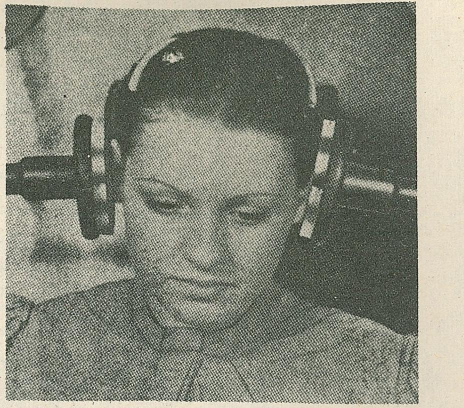

Fig. 8.—Position of electrodes for ear treatment.

In the chronic forms of otitis media short wave diathermy is of doubtful value. Good results have been obtained in tubotympanic catarrh (Fig. 9), a condition that has yielded also to conventional diathermy. No favorable effects have followed the use of short wave diathermy for tinnitus aurium, while in some patients this condition has even been temporarily aggravated.

Facial Neuralgia (Bell's Palsy)

In the early state of the peripheral form of facial neuralgia local heat is comforting and its persistent use probably leads to shortening the course of the disease (10). While infrared radiation is quite satisfactory, short wave diathermy is a more effective measure. It should be applied daily and in the interval other heating agents should be employed. After the first three or four days heat therapy must be supplemented by galvanism and massage. Some workers still adhere to the use of static electricity. In any event the combined utilization of physical measures unquestionably shortens the course of the disease and restores function of the facial muscles.

General Remarks

It may not be amiss to point out that when short wave diathermy was introduced to the medical profession a few years ago, the erroneous impression gained ground that this agent possesses mysterious biological effects apart from its thermogenetic property and that the technic of its application is simple mechanically and devoid of hazards. As a matter of fact research has to date failed in demonstrating biological properties other than those ascribable to the known local and constitutional effects of heat. It is true that certain changes in the human economy following the application of short wave diathermy are strongly suggestive of certain specific influences but absolute data in their support are yet to be established.

Technically, too, every practitioner should be thoroughly familiar with many details not only concerning dosage and method of application, but avoidance of undesirable reactions, not excepting superficial burns.